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This study determines the preference of professional school faculty for associative, replicative, interpretive, and applicative uses of knowledge, and it compares those preferences to those expressed by arts and science faculty. Relationships of use of knowledge preferences to curriculum and instruction decisions are shown. Faculty from four groups divide into two similar patterns. Professional and natural science faculty favor specialist (associative and interpretive) uses, and social science and humanities faculty favor generalist (replicative and applicative) uses. Professional faculty describe themselves as strong specialists in significantly greater frequency than do faculty from the three divisions of arts and sciences. Some statistical analyses are used. (Author/MSE)

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HIGHER PROFESSIONAL EDUCATION
AND THE
USES OF KNOWLEDGE

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ABSTRACT

This study determines the preference of professional school faculty for associative, replicative, interpretive, and applicative uses of knowledge, and it compares those preferences to the preferences expressed by arts and science faculty. Relationships of use of knowledge preferences to curriculum and instruction decisions are shown. Faculty from four groups divide into two similar patterns. Professional and natural science faculty favor specialist (associative and interpretive) uses, and social science and humanities faculty favor generalist (replicative and applicative) uses. Professional faculty describe themselves as strong specialists in significantly greater frequency than do faculty from the three divisions of arts and sciences.

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Introduction and Background

The objectives of this study were to observe the preference of professional school faculty for four uses of knowledge and to compare those preferences to those of arts and science faculty. A second major kind of objective was to observe the relationships of preferences for different uses of knowledge to the positions of faculty members on various curriculum and instruction issues. The perspective upon which this study is based is the curriculum development theory elaborated by Broudy, Smith, and Burnett (1964) in Democracy and Excellence in American Secondary Education and elsewhere by Harry Broudy. This investigator reported to the AERA in 1974 the results of an analysis of the opinions of arts and science faculty based on this conceptual framework. The present study is part of a larger, on-going analysis of the concepts related to the subject of utility in education.

Four uses of knowledge are identified as being the starting points of a curriculum development system. They are the associative use, the replicative use, the interpretive

use, and the associative use. The associative use of knowledge is the unintentional recognition of relationships between remembered items. Cognitive and psychomotor routines such as computing and driving are examples of the replicative use. The formation of concepts and the construction of cognitive maps constitute the interpretive use of knowledge. The applicative use of knowledge refers to problem solving. The associative and interpretive are the generalist uses, and the replicative and applicative are the specialist uses. The earlier study of faculty preferences for the uses of knowledge showed those preferences to be related to positions on various curriculum and instruction issues, thus establishing a link to the products of the curriculum development system.

In The Useful Arts and the Liberal Tradition, Earl F. Cheit (1975) calls attention to the growing enrollments in collegiate professional programs. Cheit offers an analysis of what he calls four "new professions" that have evolved from the former arts of farming, mechanics, and accounting. The new professions, with their corresponding collegiate institutions are agriculture, engineering, business, and forestry. They are new in comparison to the original learned professions of medicine, law, and the ministry.

While the propriety of increasing the list of occupations that are considered "professional" may be questioned, it is a trend possessing substantial momentum. In Changing Practices in Education for the Professions, Mayhew (1971) offers a definition: "A profession consists of individuals

with specialized knowledge obtained through intensive education which allows them to provide esoteric services in a near-monopoly fashion to a public which recognizes and accepts the utility of the monopoly."(p.1) This definition can be loosely applied to many fields. The study reported here will include new data from the two fields of engineering and business, but generalizations from this study and others should have significance for schools and programs in architecture, music, education, and nursing, among others.

William J. McGlothlin (1964) has provided an analysis of professions and professional schools. Among the major purposes of professions he lists "advancing knowledge." The job of the professional school is complicated by the need to balance quality and quantity. Society's need for sufficient numbers of professionals might be achieved at the cost of reduced skills and understandings of members of the profession. The significant educational objectives are seen as including ethical behavior, scholarly concern and understanding of society. In the face of these complex concerns, McGlothlin believes that professional schools have overemphasized technical competence. While he acknowledges that the professional schools must deal more with skills than Arts and Sciences colleges do, he argues that understandings, both general and professional must be emphasized.

Lewis B. Mayhew (op.cit.) has treated the issue of the general as opposed to the special as a curricular

principle, as did McGlothlin and Cheit. Mayhew points out that the scientific stress, preferred by intellectuals increases that status of the professional school in its university setting. The applied stress of the practitioner is favored, however, by the profession at large and the community of clients (the public). Mayhew and McGlothlin agree that interdisciplinary problem-solving should be a major focus of professional curriculums. Mayhew points out that integration of knowledge is best achieved through application and urges early, continuing, and substantial clinical experiences in professional programs. Application is the third principle of content in McGlothlin's scheme for professional curriculums (following Basic Arts and Sciences and Professional Sciences.) McGlothlin points out that most professional schools do not follow the example of medicine in providing substantial clinical experiences. In some cases the professions prefer to leave the applied experiences to post-graduation arrangements where the practices will be most up-to-date and to consign to the professional school the component most suitable to its skills - instruction in the Professional Sciences.

Mayhew describes the overall trend in professional programs as being toward basic science and theory rather than emphasis on specific competencies for the graduate's first job. He further describes some recent trends in curriculum and instruction which indicate that professional

programs are particularly progressive in adopting new methods such as imaginatively designed practicums, electronic and other instructional media, and interdisciplinary and cross-disciplinary courses. Mayhew acknowledges that continuing education in the professions, which must play a role of increasing importance in the future, is still relatively undeveloped. Cheit also interprets the position of professional schools as one of leadership. Their enrollments are increasing while those in the liberal arts decline. There is an increasing consensus that the professions must deal with major societal and personal issues. The desire to have higher education play a major constructive role in allowing individuals to better integrate life and career increases the attention paid to professional schools in the university community. The implication is drawn that schools of liberal arts and sciences have much to learn from the recent success of professional schools.

Engineering is a profession with a relatively long and well-studied affiliation with higher education. These studies, often undertaken by a panel selected from the profession, tend to be more descriptive and programmatic than theoretical and analytic. The profession has its origins in the military and the first American collegiate institution for engineers was the United States Military Academy, founded at West Point in 1802. Nearly half of the early West Point graduates followed civilian careers. When the Morrill Act was passed in 1862 for the support of state college and university programs in agriculture and the mechanic arts,

there were already nine private American institutions with engineering programs. The world's first doctoral degree in electrical engineering was awarded by Cornell University in 1885 (Nevins, 1962). Engineering has been defined as the art which uses science in the service of man. The dominant trend, however, in engineering education has been the growth of science and the progressive de-emphasis of manual arts. Various studies have been made of engineering education. Such studies have usually called attention to the need to bolster the liberal arts component of undergraduate programs. While prescriptions for a liberal arts component vary in the vicinity of 20%, some have noted that many schools fall substantially below this level (Holstein and McGrath, 1960).

The establishment of business administration as a collegiate field is more recent than that of engineering. A school was begun at the University of Louisiana in 1851 but closed in 1857. While the Wharton School was established in Philadelphia in 1881, its curriculum at the time was predominantly in the liberal arts. The collegiate schools of business as we know them were first established at Berkeley and Chicago in 1898. The foundation fields of economics, psychology and sociology have progressively given way to the growth of study in the professional sciences of management and finance (Cheit, op.cit.). The growth of enrollments in business programs in this century has been dramatic. Business is

today and has been for some time the largest undergraduate major field. Business education programs appear to have less to do with entrepreneurship than with the beaurocratization of big business. In that regard, programs in public administration are developing common features and in some cases even merging with business programs.

Business education has not been analyzed as extensively or as often as engineering and its goals are less explicit. One extensive study of collegiate business education was sponsored by the Ford Foundation in the 1950's, and "problem solving" was listed as the first in a series of desirable compentencies to be expected of business graduates (Gordon and Howell, 1959). The authors provide a general objective for business education: "It should be the primary objective of collegiate business education to prepare students for personally fruitful and socially useful careers in business and related types of activity"(p.47). Further discussion of objectives is usually presented in terms too general to aid research. "Interpersonal skills" and "broad understandings" are seen as desirable. The authors assert that there is wide agreement that business education should prepare for the career in general rather than for the first job and that the advocates of specialization are increasingly on the defensive.

Business education is less prone to criticism for neglecting the broadening influences of the liberal arts and sciences, since they incorporate an average of 40% of the total program in those fields (McGlothlin, op.cit.).

Related Studies

The Institute of Higher Education at Columbia University conducted two studies of faculty opinion in the late 'fifties based on the dichotomy of the liberal arts school and the professional school. In a study of the views of professional school faculty on the liberal arts by Dressel, Mayhew, and McGrath (1959), it was found that generally favorable attitudes prevailed amid some interesting differences of opinion on priorities among disciplines. Professional school faculty, represented by Agriculture, Business, Engineering, Music and others, were asked to respond to questions regarding the kinds and amounts of liberal arts requirements for students in professional programs. Liberal arts courses, i.e., courses in the arts and sciences disciplines, were seen as necessary program components by all but a few respondents. English composition was the only specific requirement receiving nearly unanimous endorsement (96.4%). Other disciplines were supported according to their relevance to the specific professional program. Agriculture and nursing faculty favored biology as a requirement, while business faculty stressed economics, and engineers would require physics. The degree to which the usefulness of disciplines is linked to the professional program could be interpreted as support for the applicative use of schooling. Most professional school faculty would be reluctant to increase the amount of study in the liberal arts, and only the journalists believed that over half (58.2%) of the under-

graduate program should be in the liberal arts.

While no explicit theoretical framework is given by Dressel, Mayhew, and McGrath, the authors explain their views on the complementarity of liberal and professional education. They point out that specialized courses in liberal arts disciplines are often as vocationally oriented as courses in education or pharmacy, and that exercise of the intellect in a vocational context is a more liberating experience than unemployment.

In a companion study to the one above, attitudes of liberal arts faculty members toward liberal and professional education were surveyed (Dressel and Lorimer, 1960). Predictably strong support for the liberal arts was found, but some interesting differences between disciplines is evident. It was found that the natural scientists were least willing to add more liberal arts courses as requirements and most willing to reduce them. Composite scores of questionnaire items on the values of liberal arts requirements were reported. Mean scores of faculty groups' responses to twenty items related to the support of liberal arts and general education showed that scientists had the least favorable attitudes toward general education requirements. Humanists were most favorable, and social scientists held the middle ground.

In responding to a question about the purpose of an academic liberal arts major, scientists revealed their stronger vocational emphasis. The percentage of scientists indicating that the major field was an important step in

the choice of a vocation was twice that of the social scientists or humanists.

The Columbia studies demonstrated the influence of a faculty member's discipline on curriculum and instruction issues. While the concept of general education was supported, faculty were protective of the primary place, as they see it, of their own discipline. Scientists supported vocational goals more than social scientists or humanists.

A survey of faculty and student opinion on the mission of the university was conducted on a single large campus by Lionel Lewis (1967). Hypotheses derivable from C.P. Snow's essay on the "Two Cultures" were tested: namely that narrow and disparate views are held on the proper goals of education, and that these differences are based on the disciplinary affiliation of the faculty member. Lewis interpreted his data as affirming Snow's thesis. Dividing faculty into four categories (Humanities, Social Science, Science, and Engineering), he found predicted differences on the relative importance of general education goals, such as vocational competence and ethical standards. Scientists favored vocational goals while humanists stressed character development. Interestingly, undergraduates reflected the same differences as the faculty in major departments, but were uniformly more vocationally oriented than faculties in their fields.

Lewis asked faculty to rate the importance of six goals "that some say the ideal public university should emphasize in its undergraduate programs" (p.262).

Percentages of faculty rating selected goals high appear below.

Percentages of Faculty Grouped by Discipline
Who Support Certain Education
Goals (Lewis, 1967: 263)

	Develop Moral Capacities Ethical Standards and Values	Provide Knowledge and Ideas about Cultural Heritage	Provide Vocational Training and Career Skills
Humanities	31.8	47.0	45.5
Social Sciences	13.4	18.8	46.4
Science	12.6	12.6	58.0
Engineering	9.4	0.0	56.3

These data support the impression that natural scientists and engineers more than others favor vocational goals. They also point out the ambiguous nature of the social sciences. Social scientists align with humanists in one case and with natural scientists in others.

Arts and science faculty were studied with regard to their emphasis on the four uses of knowledge of Broudy, Smith, and Burnett and with regard to their support for various curriculum principles and instructional practices (Haines, 1974, 1976). Some widely held beliefs have received additional support from this study and some new and unexpected patterns have emerged. Faculty members rated the generalist uses of knowledge higher for non-majors than for majors. G1, the aggregate generalist use of knowledge (UKV) measure, was found to be highly correlated with faculty members' descriptions

of themselves as generalists and with statements about some of the general and specific goals of education. Generalists, as defined by UKV score, stated that they relied less on some of the more traditional methods of teaching and evaluation, i.e., lectures, textbooks, and midterm and final exams. The study analyzed the indicated opinions and preferences of questionnaire respondents but did not investigate actual behaviors and practices.

The Generalist/Specialist tendency among faculty members varied according to the faculty member's discipline. While the distributions of GI scores by discipline were overlapping, ANOVA and the comparison of means shows that natural scientists are more specialist than either social scientists or humanists. It was also inferred from the data that social scientists fall between the humanists and natural scientists on the GI variable. The comparatively greater interest of natural scientists in vocational goals has been widely accepted and discussed in the literature, including studies cited here. Although use-of-knowledge examples were not phrased in a vocational/non-vocational context in this questionnaire, this difference in the goal orientation of natural scientists was manifest, nonetheless.

When faculty members were asked to rate examples of knowledge use for non-majors taking a distribution requirement in their field, humanists rated the associative examples higher than did natural scientists or social scientists. Social scientists consistently rated the applicative use of knowledge lower than natural scientists, or humanists.

Methods of Research

A two-part questionnaire was used. The first part polled the respondents views on a variety of curriculum and instruction issues, many of which have at least an apparent relation to general and professional education and to possible affiliation with generalist and specialist tendencies. The second section asked the respondent to rate examples of knowledge use as goals of instruction for professional programs and for programs in the arts and sciences area which is the foundation for the respondent's professional field. They are the natural sciences for engineering and the social sciences for business and public administration. The dependent variables, therefore, are the positions held by the respondents on issues of curriculum and instruction, and the relative values ascribed to the different uses of knowledge(UKV's).

Respondents rated the relative importance of eight educational goals from a list comprised of two examples of each of the four uses of knowledge. This was done once for students majoring in the respondent's professional field and once for students majoring in the foundation arts and science field. The composite generalist tendency was computed as a function of the four UKV's (generalist uses minus specialist uses plus a constant).

The independent variable is the discipline of the responding college faculty member. For this study, 89 questionnaires were received from professional schools and

departments and they are compared to the 234 responses from arts and sciences faculty which were studied earlier. Within the professional school responses, comparisons are also made between engineering faculty and business or public administration faculty. Five collegiate departments or divisions of engineering are represented, and five collegiate departments of business or public administration are represented.

Results and Discussion

Results discussed below are presented both for the differences shown between professional field and arts and science faculty and for those issues on which there is more agreement expressed than difference.

The Uses of Knowledge

The generalist uses of knowledge were consistently rated higher for social science and natural science majors than for business and engineering majors. Respondents were thus validating the concept of the uses of knowledge as characteristic objectives of academic programs. The table shows the mean UKVs and composite generalist score given by faculty from the four divisions for students majoring in the respondent's discipline.

Use of Knowledge Values

	<u>Interpretive</u>	<u>Applicative</u>	<u>Replicative</u>	<u>Associative</u>	<u>Generalist</u>
Humanists (n=40)	7.00	5.75	3.88	5.03	10.40
Social Scientists (n=29)	6.97	4.86	4.35	4.86	10.62
Natural Scientists (n=40)	6.50	6.00	5.63	4.50	7.38
Professionals (n=69)	5.68	5.94	5.30	4.72	7.06

The responses tabled above are those of faculty who responded to the same form of the questionnaire. The results present a predominantly two-sided or bipolar picture. The four groups of faculty members divided into the more generalist humanists and social scientists and the more specialist natural scientists and professionals. The one case of significant difference within the pattern is the interpretive use of knowledge. While the bipolarity is intact, the professionals score the interpretive use of knowledge significantly lower than the natural scientists. While the natural scientists are more specialist than other arts and science faculty, knowing "why" is more important to them than it is to the professional faculty.

Within the professional respondents the breakdown of UKV's is as follows.

	<u>Interpretive</u>	<u>Applicative</u>	<u>Replicative</u>	<u>Associative</u>	<u>Generalist</u>
Engineering (n=41)	5.85	6.32	5.66	4.63	6.56
Business (n=28)	5.64	5.64	5.04	5.04	7.96

While the business faculty have a significantly higher composite generalist score than the engineers ($p=.011$), their score of 7.96 is still low enough to sustain their place in the bipolar pattern with the natural scientists and engineers. The relatively low score of the business faculty for the applicative use of knowledge shows the influence of the social science foundation of the applied field. Social scientists are the arts and science group with the lowest scores for the applicative use of knowledge.

The composite generalist score was found in the study of arts and science faculty to be related to responses to many of the items on curriculum and instruction. This was less true in the current study of professional faculty. Those faculty who score high on the generalist uses of knowledge are more likely to support the development of students' personal values as a goal of education, to support increased emphasis on continuing education and to state that they use unconventional classroom methods such as simulations or games for teaching.

Self Description

Respondents were asked to describe their generalist/specialist tendency by placing themselves on a continuum between the two words. The continuum was coded from 0 (specialist) to 5(generalist.) The mean score for arts and science faculty was 2.85 and for professionals 1.99. The difference is highly significant and indicates the more hospitable environment of the professional schools

and departments to specialism. The self description was highly related to the UKV measures for arts and science faculty but not so for the professionals.

Practical/Vocational Emphasis

Several items relating to curricular emphasis on practical or vocational goals revealed significant differences between arts and science faculty and professional faculty.

<u>Item</u>	<u>Percent supporting strongly or moderately</u>	
	<u>(n=69) Professional</u>	<u>(n=234) Arts & Science</u>
4. Colleges in general should be doing a better job of preparing students for careers.	86.6	61.6
8. Course work should be more relevant to contemporary life and problems.	50.4	28.7
8.f. Less emphasis should be placed on specialized training and more on broad liberal education.	22.1	66.7
10. Undergraduate professional programs, such as those in engineering, business, and education should have a higher proportion of practical, as opposed to theoretical, experiences than they have at present.	76.5	64.1
11. Undergraduate pre-professional programs, such as those for medicine and law should have a higher proportion of practical, as opposed to theoretical, experiences than they have at present.	68.2	47.0

The difference for item 10, above, approaches significance at .05 level. Other differences are highly significant. Professional field faculty have a stronger practical/vocational inclination in matters of course selection and design.

Interdisciplinary Studies

Professional fields are interdisciplinary fields. Several items in the questionnaire polled opinions on interdisciplinary study. Results below show that professional faculty were not more favorable than arts and science faculty and in some cases were less so.

<u>Item</u>	<u>Percent Agreeing strongly or moderately</u>	
	<u>Professionals</u>	<u>Arts & Science</u>
12. A student should be allowed to design his own "major" by selecting, in consultation with an advisor, courses from various departments.	73.9	73.9
13. There should be more interdisciplinary courses at this college and at colleges in general.	70.1	78.6
15. Since the college curriculum has become fragmented into too many narrowly based courses, the number of courses should be reduced in line with a more integrated view of knowledge.	47.1	46.6
17. The following kinds of interdisciplinary departments and programs should be developed and supported in the future		
a. American Studies	68.2	69.2
b. Area Studies(e.g.East African Studies)	43.3	64.5
c. Environmental Studies	85.1	77.4
d. Urban Studies	81.8	76.9
e. Afro-Ameriacn Studies	34.8	55.0
f. Women's Studies	34.8	47.0

The lack of a difference, with professional faculty no more supportive of interdisciplinary studies than others, shows that professional fields are not interdisciplinary in an innovative way. Professional faculty probably view their fields as do other faculty. The struggle for acceptance into the university community is long past, and departmental autonomy is as important and as indicative of status in professional fields as in other fields.

Teaching Methods

Respondents were asked the extent to which they used a variety of methods for teaching and evaluation. When asked the extent to which the lecture was the predominant classroom activity as opposed to less structured classes, the percent responding "occurs often" was:

<u>Arts and Sciences</u>	<u>Professionals</u>
73.5	91.3

When asked the prominence of a specific textbook assignment as opposed to more varied reading assignments, the percent responding "Most courses" was:

<u>Arts and Sciences</u>	<u>Professionals</u>
67.9	92.8

The above differences are highly significant and suggest that the progressive role ascribed by Mayhew (op.cit.) and Cheit (op.cit.) to professional schools is not supported by faculty attitudes or practices. Professional faculty appear to rely more heavily on traditional teaching methods than do arts and sciences faculty.

Summary

This study has shed some light on the comparative position of professional schools in the university setting. Professional faculty are more specialist than arts and science faculty by self-description. They are about as specialist as natural scientists according to the relative

emphasis they place on the associative, interpretive, applicative, and replicative uses of knowledge. Within the group of professionals, business faculty are less specialist than engineers, reflecting the influence of the social sciences in their background. Professional faculty are over-represented among those that support practical and vocational emphasis in course design and selection. They do not support interdisciplinary studies more than others; they do support traditional methods of instruction.

The concept of the four uses of knowledge has proven to be a useful analytical tool in the study of liberal and professional education. The responses of over three hundred faculty members can be rationally interpreted within the framework of the curriculum development theory of Broudy, Smith, and Burnett, and some responses have lent validity to that theory by their predictability.

References

- Broudy, H.S., B.O. Smith, and J.R. Burnett, 1964. Democracy and Excellence in American Secondary Education: A Study in Curriculum Theory, Chicago: Rand McNally and Company.
- Cheit, E.F., 1975. The Useful Arts and the Liberal Tradition, New York: McGraw-Hill Book Company.
- Dressell, P.L., and M.F. Lorimer, 1960. Attitudes of Liberal Arts Faculty Members Toward Liberal and Professional Education, New York: Institute of Higher Education.
- Dressell, P.L., L.B. Mayhew, and E.J. McGrath, 1959. The Liberal Arts as Viewed by Faculty Members in Professional Schools, New York: Institute of Higher Education.
- Gordon, R.A., and J.E. Howell, 1959. Higher Education for Business, New York: Columbia University Press.
- Haines, M.F., 1974. "The Uses of Knowledge as Determinants of College Curriculum," presented at the Annual Meeting of the American Educational Research Association, Chicago.
- Haines, M.F., 1976. "College Teachers' Views on Uses of Knowledge and the Relationships of Those Views to Certain Curricular - Instructional Practices." Unpublished dissertation, State University of New York at Albany.
- Holstein, E.J., and E.J. McGrath, 1960. Liberal Education and Engineering, New York: Institute of Higher Education.
- Lewis, L.S., 1967. "Two Cultures: Some Empirical Findings," Educational Record 48: 260-267.
- Mayhew, L.B., 1971. Changing Practices in Education for the Professions, Atlanta: Southern Regional Education Board.
- McGlothlin, W.J., 1964. The Professional Schools, New York: The Center for Applied Research in Education.
- Nevins, A., 1962. The State Universities and Democracy, Urbana, Illinois: University of Illinois Press.